CLAIMS

1. A method comprising:

providing an electron gun having a first head and an accelerating electrode, the first head having a power rating and a thermionic electron source;

replacing the first head with a second head, the second head having a power rating and a thermionic electron source, one of the power rating of the first head and the power rating of the second head being at least twenty-five percent less than the other of the power rating of the first head and the power rating of the second head; and

subsequently operating the electron gun without replacing the accelerating electrode.

2. The method of claim 1 wherein the power rating of the second head is at least twenty-five percent less than the power rating of the first head.

3. The method of claim 2 wherein the thermionic electron source of the first head and the thermionic source of the second head each extends in a longitudinal direction.

4. The method of claim 2 wherein the power rating of the second head is at least thirty percent less than the power rating of the first head.

5. The method of claim 2 wherein the accelerating electrode is connected to a cooling system and a deflection system and the step of subsequently operating is carried out without replacing greater than one of the cooling system and the deflection system.

6. The method of claim 5 wherein the step of subsequently operating is carried out without replacing either of the cooling system and the deflection system.

7. The method of claim 6 wherein the thermionic electron source of the first head, the thermionic source of the second head, and the accelerating electrode each extends in a longitudinal direction.

8. The method of claim 1 wherein the first head has at least one reference member and the second head has at least one reference member, the electron gun further has a platform that supports the head and has at least one adjustably located locating member that engages the at least one reference member of the first head, the location of the at least one locating member is adjustable by at least nine millimeters, and the step of replacing further includes adjusting the location of the adjustably located locating members so that the platform supports the second head and the at least one adjustably located locating member engages the at least one reference member of the second head.

9. The method of claim 1 wherein the electron gun further comprises at least one platform support supported by the accelerating electrode and having a support surface that is adjustably spaced from the accelerating electrode and supports the platform, and the step of replacing further includes adjusting the spacing between the accelerating electrode and the platform.

10. Apparatus for an electron gun, the apparatus comprising:

a head having a thermionic electron source that extends in a longitudinal direction and further having at least one reference member;

an accelerating electrode; and

a platform positioned spaced apart from the accelerating electrode and having at least one locating member adjustably located on the platform, the location of the at least one locating member being adjustable by at least nine millimeters in a direction transverse to the longitudinal direction, wherein the at least one reference member engages the at least one locating member to position the head in three dimensions relative to the accelerating electrode.

11. The apparatus of claim 10 wherein the one of the at least one reference member and the at least one locating member comprising a projection, the other of the at least one reference member and the at least one locating member comprising a recess.

12. The apparatus of claim 10 wherein the at least one reference member of the head comprises two recesses and the at least one locating member of the platform comprises two projections.

13. The apparatus of claim 10 wherein the at least one locating member of the platform comprises a spacer having two holes, the platform further having screws, each of the screws having a head and a shank, the shank having a diameter, the shank of the screws extending through the holes and engage the platform, the holes being elongated relative to the diameter of the shank to provide a clearance between the spacer and the shank to facilitate adjustment of the position of the locating member relative to the platform and the accelerating electrode.

14. The apparatus of claim 10 wherein the at least one reference member of the head comprises two recesses and the at least one locating member of the platform comprises two locating members, each of the locating members comprising a spacer and a projection, each of the spacers having two holes, the platform further having screws, each of the screws having a head and a shank, the shank having a diameter, the shank of the screws extending through the holes and engage the platform, the holes being elongated relative to the diameter of the shank to provide a clearance between the spacer and the shank to facilitate adjustment of the position of the locating member relative to the platform and the accelerating electrode.

15. Apparatus for an electron gun, the apparatus comprising:

a head having a thermionic electron source that extends in a longitudinal direction;

an accelerating electrode;

a platform that supports the head; and

at least one platform support supported by the accelerating electrode and having a support surface that is adjustably spaced from the accelerating electrode and supports the platform.

16. The apparatus of claim 15 wherein the at least one platform support comprises an insulator, an insulator cover, and a support member, the insulator cover is retained to insulator and has an engagement surface, and the support member has the support surface disposed thereon and engages the engagement surface to adjustably space the support surface from the accelerating electrode.

17. The apparatus of claim 16 wherein the engagement surface of the insulator cover comprises a plurality of threads, and the support member is a support ring with a plurality of threads that engage the threaded engagement surface of the insulator cover.

18. The apparatus of claim 15 wherein the head has at least one reference member and the platform has at least one locating member adjustably located on the platform, the at least one locating member having a location on the platform, the location of the at least one locating member being adjustable by at least nine millimeters, wherein the at least one reference member engages the at least one locating member to position the head in three dimensions relative to the accelerating electrode.

19. The apparatus of claim 17 wherein the head has at least one reference member and the platform has at least one locating member adjustably located on the platform, the at least one locating member having a location on the platform, the location of the at least one locating member being adjustable by at least nine millimeters, wherein the at least one reference member engages the at least one locating member to position the head in three dimensions relative to the accelerating electrode.

20. The apparatus of claim 15 wherein the at least one reference member of the head comprises two recesses and the at least one locating member of the platform comprises two locating members, each of the locating members comprising a spacer and a projection, each of the spacers having two holes, the platform further having screws, each of the screws having a head and a shank, the shank having a diameter, the shank of the screws extending through the holes and engage the platform, the holes being elongated relative to the diameter of the shank to provide a clearance between the spacer and the shank to facilitate adjustment of the position of the locating member relative to the platform and the accelerating electrode.

21. The apparatus of claim 17 wherein the at least one reference member of the head comprises two recesses and the at least one locating member of the platform comprises two locating members, each of the locating members comprising a spacer and a projection, each of the spacers having two holes, the platform further having screws, each of the screws having a head and a shank, the shank having a diameter, the shank of the screws extending through the holes and engage the platform, the holes being elongated relative to the diameter of the shank to provide a clearance between the spacer and the shank to facilitate adjustment of the position of the locating member relative to the platform and the accelerating electrode.